AMENDMENT UNDER 37 C.F.R. § 1.116
Appln. No. 09/601,078

Docket No. Q60201
Art Unit 1733

REMARKS

Claims 1-10 are all the claims pending in the application. Claims 1, 2, and 7 are independent claims.

Claims Rejections 35 U.S.C. § 112

Claims 1-10 are rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite. Although Applicant believes that the scope of the claims is clear, as a path of least resistance, Applicant has added the recitation --of the plurality of reinforcing layers-- to independent claims 1, 2, and 7, as suggested by the Examiner. Since the "outermost reinforcing layer" is, of course, one of the plurality of reinforcing layers, this amendment does not narrow the scope of the claims. Therefore, no estoppel is inflicted by the amendment.

Claim Rejections 35 U.S.C. § 103

Claims 1 and 7-10 are rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over 1) Moseley et al. (US 5,669,993) in view of 2) either *newly cited* Collette et al. (4,856,571) or JP 62-286805, in view of 3) *newly cited* EP 0 605 849 and Blow's article "Rubber Technology and Manufacture", and in further view of 4) JP 9-323510 and WO 96/01190. Claims 2-6 are rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Moseley in view of either Collette or JP '805, in view of EP '849 and Blow, in view of JP '510 and WO '190, and in further view of 5) Lagnier (US 5,783,002).

Claims 2 and 7

With respect to independent claims 2 and 7, Applicant respectfully requests the Examiner to withdraw the rejection of these claims at least because none of the cited references taken alone

or in combination teaches or suggests the claimed pneumatic tire in which "the sipe is twisted such that a self alignment torque is generated by the block so as to reduce a self alignment torque generated due to the cords provided parallel to each other in an outermost reinforcing layer of the plurality of reinforcing layers."

A self alignment torque ("SAT") generally represents a torque directed toward recovering the original state of a tire. This self alignment is provided to a tire when a vehicle is turned and, as such, a lateral force CF is generated in the tire. Accordingly, when the vehicle has not been turned by the driver, this type of self alignment does not occur in the tire (a state hereinafter referred to as when the slip angle ("SA") is 0°) and neither lateral force CF nor SAT is generated.

However, other forces such as ply steer are likely to be generated by the tire even when SA is 0°. These CF and SAT forces are of small magnitude and depend on the inclination angle of the belt in the outermost reinforcing layer and/or uneven distribution of block rigidity due to the inclination of grooves. These small CF and SAT are generally referred to as "residual CF" ("RCF") and "residual SAT" ("RSAT").

The present invention is directed to addressing the aforementioned RCF and RSAT. Specifically, the present invention proposes a unique sipe arrangement in which the RSAT generated by the belt layers is canceled out by RSAT generated by the tread pattern, even when SA is 0°. By providing the claimed sipe arrangement, the claimed invention actually suppresses the self alignment torque due to the cord layers.

In contrast, Moseley discloses a tire structure with a block having a specific wall configuration in which the rigidity in a twisting direction of the block is unbalanced so that the

configuration provides an SAT only when the block is compressed by a force given to the tire land portion (i.e. the block). Therefore, the reduction in a tire's RSAT in Moseley is only accomplished when the vehicle is turned so that the tire is subjected to an SA of greater than 0°.

As such, the configuration of Moseley does not "reduce the self alignment torque generated due to the cords", as is claimed, but instead merely counteracts the RSAT of the tire block surface caused by the turning of the vehicle.

In addition, Applicant notes that the claimed structure can be produced much more easily than Moseley's structure. Producing a mold (generally made of metal) to make the block wall configuration of Moseley would be extremely difficult. This type of metal mold is generally made from a plaster mold. However, producing a plaster mold in which the wall configurations are twisted would be very difficult. In contrast, the claimed tire does not have these production problems due to the fact that, in the claimed invention, the wall configurations are not required to be twisted.

Also, with regard to the other applied references, (JP '805, WO '190, JP '510, Lagnier, and Collette), although these references may disclose various types of three dimensional sipes, they fail to make up for the deficiency in Moseley discussed above, i.e., that the RSAT generated by the belt layer is canceled by the 3D arrangement of the sipes. Specifically, EP '849 merely discloses a technique in which the RSAT of the tread pattern as a whole is cancelled out by controlling the groove-wall angle of the lug grooves of the shoulder blocks on both sides. EP '049 proposes a *macro* technique of dynamically controlling RSAT of the tread surface as a

whole (page 6, lines 28-41). In contrast, the claimed invention provides a *micro* technique of canceling RSAT generated by the belt, which occurs even when SA is 0°.

As such, Applicant respectfully requests the Examiner to withdraw the rejection of independent claim 7 at least for the reasons discussed above. In addition, Applicant respectfully requests the Examiner to withdraw the rejection of independent claim 2 at least for the reasons discussed above and because Lagnier, which the Examiner asserts in an attempt to show wave shaped sipes, does not cure the deficiencies discussed above with respect to the combination of Moseley and the other references applied in the rejection of claim 7. Applicant also requests that the Examiner withdraw the rejections of dependent claims 3-6 at least because of their dependency from claim 2.

Claim 1

With respect to independent claim 1, the Applicant respectfully requests the Examiner to withdraw the rejection of these claims at least 1) because (as is discussed above with respect to claims 2 and 7) none of the cited references taken alone or in combination teaches or suggests the claimed pneumatic tire in which "the sipe is twisted such that a self alignment torque is generated by the block so as to reduce a self alignment torque generated due to the cords provided parallel to each other in an outermost reinforcing layer of the plurality of reinforcing layers", and additionally 2) because none of the cited references taken alone or in combination teaches or suggests the claimed pneumatic tire "wherein said sipe is shaped so as to be twisted around a first central axis of twisting extending in a tire radial direction in the block shaped land

portion and a second central axis of twisting extending substantially in a tire transverse direction."

For example, in Moseley, each block is twisted in order to cancel the moment generated by each block of the tire (col. 3, lines 26-37). The twisted block walls function, with respect to the center of gravity of the blocks, to cancel the moment generated by the block. As such, Moseley merely teaches a single axis of twisting of the tread elements, an axis in the tire radial direction (Z) (*see*, for example, Figs. 3 and 14). Accordingly, directing the axis of twisting to any other direction, so that it would include two central axes of twisting (one in the tire radial direction and one in the tire transverse direction) is not taught or suggested by Moseley.

In addition, none of the other references cited by the Examiner teach or suggest the claimed pneumatic tire in which the sipes are twisted around two central axes of twisting.

As such, Applicant respectfully requests the Examiner to withdraw the rejection of independent claim 1 at least because of the reasons discussed above. In addition, Applicant respectfully requests the Examiner to withdraw the rejection of dependent claims 8-10 at least because of their dependency from claim 1.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

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The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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PATENT TRADEMARK OFFICE

Date: May 14, 2003

CERTIFICATION OF FACSIMILE TRANSMISSION

Sir:

I hereby certify that the above identified correspondence is being facsimile transmitted to Examiner Steven D. Maki at the Patent and Trademark Office on May 14, 2003 at (703) 872-9311.

Respectfully submitted,

John M. Bird

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APPENDIX
VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

The claims are amended as follows:

Claim 1. (Amended) A pneumatic tire comprising:

a plurality of reinforcing layers in each of which cords, which are inclined at a predetermined angle with respect to a tire circumferential direction, are provided parallel to each other;

a tread provided on a top of said reinforcing layers which are laminated; and

a block-shaped land portion having a sipe, said block-shaped land portion being defined on a tread surface by main grooves formed in the tire circumferential direction and by lug grooves formed in a direction intersecting with the main grooves;

wherein said sipe is shaped so as to be twisted around a first central axis of twisting extending in a tire radial direction in the block shaped land portion and a second central axis of twisting extending substantially in a tire transverse direction, a position P1 of said first central axis of twisting in a region between one end surface of the block-shaped land portion and another end surface in the tire transverse direction and a position P2 of said central axis of twisting in a region between a contact patch area and a bottom of the sipe in the tire radial direction being within ranges satisfying the following expressions:

$0.2W \leq P1 \leq 0.8W$

$0.2F \leq P2 \leq 0.6F$

wherein P1, P2 represent the position of the first and second central axes of twisting; W represents a distance from one end surface to the other end surface of the block-shaped land portion in the tire transverse direction; and F represents a distance from the contact patch area to the bottom of the sipe in the tire radial direction; and

wherein the sipe is twisted such that a self alignment torque is generated by the block so as to reduce a self alignment torque generated due to the cords provided parallel to each other in an outermost reinforcing layer of the plurality of reinforcing layers.

2. (Amended) A pneumatic tire comprising:

a plurality of reinforcing layers in each of which cords, which are inclined at a predetermined angle with respect to a tire circumferential direction, are provided parallel to each other;

a tread provided on a top of said reinforcing layers which are laminated; and

a block-shaped land portion having a sipe, said block-shaped land portion being defined on a tread surface by main grooves formed in the tire circumferential direction and by lug grooves formed in a direction intersecting with the main grooves;

wherein said sipe is shaped so as to have a first protruding portion protruding in a first direction with respect to a virtual central plane and a second protruding portion protruding in a second direction opposite the first direction across the virtual central plane, said sipe including a surface portion exposed on a contact patch area of said block-shaped land portion and a bottom

portion formed in a bottom of the sipe, the virtual central plane and thereby said sipe being twisted from the surface portion toward the bottom portion; and

wherein the sipe is twisted such that a self alignment torque is generated by the block so as to reduce a self alignment torque generated due to the cords provided parallel to each other in an outermost reinforcing layer of the plurality of reinforcing layers.

7. (Amended) A pneumatic tire comprising:

a plurality of reinforcing layers in each of which cords, which are inclined at a predetermined angle with respect to a tire circumferential direction, are provided parallel to each other;

a tread provided on a top of said reinforcing layers which are laminated; and

a block-shaped land portion having a sipe, said block-shaped land portion being defined on a tread surface by main grooves formed in the tire circumferential direction and by lug grooves formed in a direction intersecting with the main grooves;

wherein said sipe is shaped as a closed loop which is connected with neither said main groove nor said lug groove, said sipe including a surface portion exposed on a contact path area of the block shaped land portion and a bottom portion formed in a bottom of a sipe, the sipe being twisted from said surface portion toward said bottom portion; and

wherein the sipe is twisted such that a self alignment torque is generated by the block so as to reduce a self alignment torque generated due to the cords provided parallel to each other in an outermost reinforcing layer of the plurality of reinforcing layers.